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ABSTRACT

The complexity of language of four, five, and six year old children was examined in a psycholinguistic study that attempted to differentiate the characteristics of sentences that were difficult for children to comprehend from those which were easy, and to discover whether children used a subject-verb-object (S-V-O) language strategy to interpret all of these sentences. A racially mixed group of 108 children participated in three sessions where they were asked to imitate or interpret (comprehend) approximately 100 sentences involving complex grammatical constructions. The five major parts of the study centered around five different sentence constructions: datives, genitives, comparison sentences, contrast sentences, and control sentences. Results indicated that sentence difficulty increased according to the deviation from the S-V-O word order and the greater number of concepts in a sentence, and decreased in the presence of semantic constraints on sentence interpretation. The presence of syntactic cues to structure failed to decrease sentence difficulty. (Eighteen tables are provided and appendixes include the scoring procedure for the imitation task, sample pictures used in the comprehension task, and a table of percent of correct responses for selected dative and genitive sentences.) (MAI)

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FINAL REPORT

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COMPLEXITY IN CHILD LANGUAGE

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INTRODUCTION

Goals

The major goals of this project were (1) to gain a better understanding of the characteristics differentiating sentences which are difficult for children from those which are easy and (2) to discover the extent to which children use a subject-verb-object language processing strategy to interpret these difficult sentences which are beyond their linguistic competence.

The project examined complexity in the language of four-, five-, and six-year-old children; this "psychological complexity" is related to the difficulty of a sentence in a performance task, as measured by the number of errors made.

Background

Since the 1960's, the study of children's language acquisition has been a rapidly developing and important field. This section of the report will review the language acquisition literature most directly related to the current project.

Imitation

In the present research, imitation means repetition of a model sentence presented by the experimenter. Slobin and Welsh (1972) have pointed out the value of such "elicited imitation," as opposed to spontaneous imitation, as a device for learning about children's language. Rodd and Braine (1970) have also emphasized the importance of children's imitations as a measure of their linguistic competence.

Several studies have demonstrated that the syntactic structure of a sentence is an important factor in determining the accuracy of children's

imitations. For example, Menyuk (1963,1969) studied three- to six-year-old children to evaluate their ability to imitate grammatical sentences which represented a number of different transformations. Her interpretation was that children impose structure on a sentence in the process of repeating it. She also found that in sentences up to nine words, length was not a significant factor in determining the success in imitation, even for children only three years old. Similarly, Slobin and Welsh (1972) found that sentence length, whether measured in words or morphemes, did not predict the child's performance in an imitation task.

In another repetition study, Smith (1970) asked three-and four-year-old children to repeat both grammatical and ungrammatical sentences. Her results showed that the children imitated ungrammatical sentences less accurately, indicating that they used structural cues in producing their imitations. Smith also demonstrated that certain grammatical structures were more difficult for children to imitate than others.

Among the other investigators who have used the elicited imitation technique to study children's grammar are Fischer (1971) who studied the acquisition of direct and indirect object constructions by three- and four-year-old children; Baird (1973), who studied relative clause imitation by children aged four, six, and eight years, as well as adults; and Bohannon (1975), who studied word order distortion and sentence length in the imitations of first-, second-, and fifth-grade children.

Comprehension[1]

"Comprehension" refers to the capacity for understanding a sentence. One test of whether children have comprehended a sentence is to observe whether they can correctly identify the picture which corresponds to the

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[1] This part of the report includes studies of both imitation and comprehension, with emphasis on the comprehension results. It also includes a few relevant studies with adults.

sentence they have just heard. This picture identification technique is one of the most frequently used methods for evaluating children's syntactic competence (Menyuk, 1971), and it is a technique chosen for the current research. Another common method is to ask children to manipulate objects to demonstrate their understanding of linguistic structures.

Word order. Carol Chomsky (1969) tested five- to ten-year-old children on their comprehension of certain syntactic structures by asking them to manipulate toys, answer questions, or give instructions. Her experiments included sentences in which the surface structure of the sentence was misleading with respect to the subject-verb-object relationship of the underlying structure. Chomsky's study revealed that these syntactic structures are still being learned by children up to the age of nine, or even later. Kessel (1970) and Kramer, Koff, and Luria (1972) have also investigated these structures.

Earlier comprehension studies involving active and passive sentences have also shown that children tend to interpret sentences as if they were in the standard subject-verb-object (S-V-O) word order. For example, Slobin (1966), Turner and Rommetveit (1967), and Fraser, Bellugi, and Brown (1963) have all shown that children's performance on active sentences (e.g., "The girl hit the ball.") was superior to performance on passive sentences (e.g.,"The ball was hit by the girl."). Bates (1969) also studied the acquisition of active and passive sentences with similar results.

The present research will investigate the importance of S-V-O word order in sentence interpretation.

Word order also seems to be important in sentences involving both direct objects and indirect objects. Two studies, one by Stayton (1972)

and another by Fischer (1971), indicated that children may prefer an order in which the direct object is followed by the indirect object. In early child speech, however, the data reviewed by Brown (1973) would tend to indicate that, if there is a preference, it would be for an indirect object-direct object word order.

Reversibility. Syntactic complexity alone is often not enough to predict performance in comprehension tasks. Investigators also believe that semantic factors are important. Slobin (1966) found that the semantic factor of reversibility affected the processing difficulty of active and passive sentences. A "reversible" sentence is one in which the subject and object can be reversed (e.g., "The girl hits the ball.") while in a "nonreversible" sentence (e.g., "The man pets the horse.") the subject and object cannot be reversed. Slobin found that for reversible sentences, passive forms were harder to understand than actives. For nonreversible sentences passives were not harder to understand.

Turner and Rommetveit (1967,1968) investigated children's performance on active and passive sentences, both of which were in a reversible or nonreversible form. They tested children from nursery school through the third grade on imitation and comprehension (picture identification) tasks. In each of the tasks, the semantically nonreversible sentences were easier than the reversible sentences. DeVilliers and deVilliers (1973) have also studied reversibility, using active and passive sentences presented to children who were two and three years of age.

In the present study reversibility was examined in several different kinds of complex sentences to ascertain whether this factor is more important on a comprehension task than on an imitation task.

Syntactic cues to structure. Fodor and Garrett (1967) have sug-

gested that understanding a sentence requires the listener to recover the grammatical relations that obtain among its parts. The complexity of a sentence is a function of the "degree to which the arrangement of elements in the surface structure provides clues to the relations of elements in the deep structure." To demonstrate the importance of surface structure cues, Fodor and Garrett asked adult subjects to give paraphrases for three lists of self-embedded sentences. The perceptual complexity of the three lists was evaluated in terms of the accuracy and time required for paraphrase. One list had sentences with relative pronouns in the relative clause (e.g., "The shot which the soldier that the mosquito bit fired missed.") A second did not have the pronouns (e.g., "The shot the soldier the mosquito bit fired missed."). As predicted, the presence of relative pronouns facilitated paraphrase while the presence of adjectives produced no significant changes in performance.

Shipley and Catlin (1969) obtained a similar result on a repetition task with seven children aged seven to nine years. Performance on imitation of sentences containing relative clauses was influenced by the presence (or absence) of the relative pronoun. If the relative pronoun was present, the sentence was easier to imitate (e.g., "The baby who cried met the cat."). If it was absent, the sentence was difficult to imitate (e.g., "The boy the girl saw ran home."). Slobin and Welsh (1972) obtained a similar result.

Sentence embedding. Several investigators have studied the difficulty of sentence embedding (e.g., "The cat the girl sees is playing with a ball.") for children, using a comprehension task. Gaer (1969) found that center-embedding and double-embedding made sentences more

difficult for three-to six-year-old children. In a study of relative clauses, Brown (1971) found that embedding did not always make a sentence more difficult, but that deviation from S-V-O word order in the relative clause did increase difficulty for three-to-six year olds. Sheldon (1974), in another study of relative clauses, tested children approximately four and five years of age. She found that if the grammatical function of the co-referential noun phrases was the same in their respective clauses (e.g.,"The dog that jumps over the pig bumps into the lion" in which dog and that are both subjects), then the sentence was easier for children to understand than a similar sentence in which the co-referential noun phrases have different grammatical functions (e.g., "The lion that the horse bumps into jumps over the giraffe" in which lion is a subject but that is a direct object.) She stated that sentence embedding and word order did not account for her results as well as the above factor of parallel grammatical function.

The placement of the sentence embedding, whether at the beginning or at the end of the sentence, was studied in the current project.

Study by the author. In a study of grammatical development in three- to five-year-old white middle-class children, the author (Gordon 1972a) asked children either to imitate or to show their comprehension of different sentences which involved relative clauses and adjectives (see Table 1). The sentences were then ordered for their difficulty or psychological complexity. The study demonstrated that although several factors (i.e.,the number of concepts in the sentence) accounted for the complexity of the sentences, the main source of difficulty stemmed from two factors:

1. Deviation from standard S-V-O word order.
2. Interruption of a clause, by another phrase or clause (i.e. "interruption of a linguistic unit").

TABLE 1

Study of Relative Clauses and Adjectives

(Gordon 1972a)

A. Examples of the types of paraphrase sets used in author's previous research. Note that the five sentences in each set vary in grammatical form, but have approximately the same meaning.

Type I	Form a.	The bird is singing. The bird is yellow.
	Form b.	The bird that is singing is yellow.
	Form c.	The bird singing is yellow.
	Form d.	The singing bird is yellow.
	Form e.	The yellow bird is singing.
Type II	Form a.	The boy is kicking the cow. The boy is fat.
	Form b.	The boy who is kicking the cow is fat.
	Form c.	The boy kicking the cow is fat.
	Form d.	The boy who is fat is kicking the cow.
	Form e.	The fat boy is kicking the cow.
Type III	Form a.	The cow is kicking the boy. The boy is fat.
	Form b.	The boy who the cow is kicking is fat.
	Form c.	The boy the cow is kicking is fat.
	Form d.	The cow is kicking the boy who is fat.
	Form e.	The cow is kicking the fat boy.

B. Factors which accounted for the differential difficulty of the sentences

Difficulty was increased by:

(1) Deviation from subject-verb-object order (Example: Type IIIb)
(2) Interruption of a clause. (Example: Type IIb)
(3) Greater number of clauses. (Example: Type IIId)
(4) Greater number of concepts. (Example: Type II, vs. Type I)

Difficulty was decreased by:

(5) Semantic constraints on interpretation.
Sentences in which it was not semantically possible to reverse the subject and object (i.e. "The man pets the horse.") were easier than sentences in which the subjects and objects could be reversed (i.e. "The boy kicks the cow.").

Although predicted to decrease difficulty, factor (6), the presence of surface cues to structure (i.e. the relative pronoun), actually increased sentence difficulty.

The error analyses showed that the children might be using an S-V-O processing "strategy." That is, they seemed to interpret complex sentences as if they were two simpler sentences composed of a subject and verb and, optionally, an object. For example, both of the following sentences

"The boy who is kicking the cow is fat." and

"The boy who the cow is kicking is fat."

were interpreted, both in imitation and in comprehension, as

"The boy is kicking. The cow is fat."

This intriguing and potentially important result was tested for its generality in the current research.

Language Processing Strategies

The studies of imitation and comprehension have also led to the development of new ideas concerning language processing strategies. In fact all the psychological studies reviewed so far have presented evidence concerning human performance on language processing tasks. But how does the listener process incoming speech? Bever (1970) has posited several perceptual strategies which both children and adults may use in their language processing. The following kinds of strategies are representative:

1. Segment together any sequence X...Y, in which the members could be related by primary internal structural relations, "actor, action, object...modifier."

2. The first N V (N) clause (isolated by Strategy 1) is the main clause, unless the verb is marked as subordinate.

3. Constituents are functionally related internally according to semantic constraints.

4. Any Noun-Verb-Noun (NVN) sequence within a potential internal unit in the surface structure corresponds to "actor-action-object."

In each case, structural cues are relevant for determining underlying sematic relations.

A comprehension study by Sinclair and Bronckart (1972) suggested that Bever's fourth strategy (above) is more complex in development than one might suppose. They had three- to seven-year-old French-speaking children act out the interpretation of sentences with toys, and concluded that there were several stages in the development of a NVN processing strategy. In addition, Bever and Langendoen (1971) have proposed the following perceptual strategy.

1. A string consisting of a nominal phrase is the beginning of an internal structure sequence.
2. The verb phrase (optionally including a nominal) is the end of such a sequence.

The current project utilized Bever's strategies, and Slobin's operating principles discussed below, as a guide both in the selection of particular sentence characteristics and also in the selection of the S-V-O processing strategy as being an important focus of the study.

Slobin (1971b) has conceptualized language processing variables as a system of "operating principles." These are general heuristics or "self instructions" which the child can use when learning to speak, regardless of the particular language to which he is exposed. The operating principles are products of the child's psychological capacity to process, organize, and store information, and they guide the child in the development of language acquisition strategies. Slobin's developmental "universals" are more specific predictions based on the operating principles; the ones which are relevant to this study are summarized in Table 2.

Another valuable discussion of syntactic processing, as well as sound system and lexical processing, can be found in Ervin-Tripp (1970). In a section on grammatical processing, she included some of the same

TABLE 2

Some Suggested Universals in the
Ontogenesis of Grammar
(Slobin 1971)

1. Word order

   Operating Principle C: Pay attention to the order of words and morphemes.

   Universal C 3. Sentences deviating from standard word order will be interpreted at early stages of development as if they were examples of standard word order.

2. Surface preservation of underlying structure.

   Operating Principle D: Avoid interruption or rearrangement of linguistic units.

   Universal D 1. Structures requiring permutation of elements will first appear in non-permuted form.

   Universal D 2. Whenever possible, discontinuous morphemes will be reduced to or replaced by continuous morphemes.

   Universal D 3. There is a tendency to preserve the structure of the sentence as a closed entity, reflected in a development from sentence external placement of various linguistic forms to their movement within the sentence.

   Universal D 4. The greater the separation between related parts of a sentence, the greater the tendency that the sentence will not be adequately processed (in imitation, comprehension, or production).

3. Clear marking of underlying relations.

   Operating Principle E: Underlying semantic relations should be marked overtly and clearly.

   Universal E 4. When a child first controls a full form of a linguistic entity which can undergo contraction or deletion, contraction or deletion of such entities tends to be absent.

   Universal E 5. It is easier to understand a complex sentence in which optionally deletable material appears in its full form.

processing heuristics that Slobin (1971b) had posited. She also agreed with Fodor (1967) that "the presence of clues to guide the conversion of surface structure into deep structure may alter the ease of processing."

Other language processing strategies have been discussed in the literature on children's language. For example, Clark (1970, 1971) has proposed that children use an order-of-mention strategy to describe events in time and to interpret sentences involving before and after. None has received the attention given to the subject-verb-object processing strategy. However, the focus of attention in these studies generally has been on simpler sentences (e.g., passives) or on just one type of complex sentence (e.g.,sentences with relative clauses.)

At the present time it is not clear whether children actually use operating principles or perceptual strategies such as those discussed above. One investigator, Welsh (Ervin-Tripp, 1970) did propose a tentative model for sentence processing in imitation, but his suggestions were somewhat speculative since his model was based on an exploratory study by Slobin and Welsh (1972) in which only a few examples of each sentence type were given to just one child. The present research has the advantage of concentrating on a smaller range of structures with more examples of each type, while at the same time not being limited to just one or two structures as in most previous research. This method should allow a greater possibility of discovering whether an S-V-O processing strategy has been used by the children.

Rationale for Research

The present research was concerned with the question of why certain structures are more difficult for children to imitate and comprehend than others. The author's previous research (Gordon, 1972a) had

identified sentence characteristics related to performance difficulty, or "psychological complexity" (see Table 1), and presented evidence concerning the role of a subject-verb-object language processing strategy in children's interpretation of sentences. This project was designed to extend that line of research by attempting to generalize the results across different grammatical structures.

The study investigated the ability of four-, five-, and six-year-old children to understand complex English sentences. In the study, complexity was related to the difficulty of a sentence in a performance task, as measured by the number of errors made. The two major purposes of the study, and two complementary, secondary purposes, are described below.

Sentence Difficulty

The first purpose of the study was to determine the difficulty of selected types of complex sentences. There has been relatively little research concerning children's performance on the complex sentences studied in the current project, especially datives and genitives. Furthermore, many other studies have concentrated on just one type of sentence, so that it has not been possible to ascertain the relative difficulty of one sentence type versus another. Therefore, it seemed valuable to obtain more information on the difficulty of these sentence types for children.

Sentence Characteristics

One major purpose of the study was to gain a better understanding of the characteristics differentiating sentences which are difficult for children from those which are easy. In order to understand the problem posed in this research, suppose that two sentences convey the

same "idea." That is, suppose most speakers would agree that Sentence E (easy) and Sentence H (hard) "mean the same thing," and thus are paraphrases of each other. Then the two sentences would only differ in the sentence structure which is used to communicate the idea. The characteristics that differentiate such sentences are a major focus of this research.

For example, consider the following paraphrase set:

Form a. Mary kissed Bill.

Form b. Bill was kissed by Mary.

These sentences seem to differ in their intelligibility, at least for a child. Form "a" seems easier; the words are in the normal subject-verb-object (agent-action-object) order. The other form has an object-verb-subject order, and might be interpreted in terms of normal subject-verb-object (S-V-O) order as, "Bill kissed Mary." In fact, previous studies have shown that sentences such as Form a, which preserve standard S-V-O word order, were easier for children to interpret than sentences whose elements deviate from this order, as they do in Form b. The present study sought to generalize this finding to a broader class of more complex sentences. The major premise of the study was that word order is a primary characteristic governing children's interpretation of English sentences, especially complex sentences which are beyond their linguistic competence. Therefore "deviation from standard S-V-O word order" was an important sentence characteristic investigated in this project.

Listed below are the sentence characteristics studied, and their predicted effect upon performance difficulty, all other things being equal.

Deviation from standard S-V-O word order should increase sentence difficulty. This sentence characteristic was studied in dative sentences, genitive sentences, and in the two types of comparison sentences, passives and relatives. In the author's previous study (Gordon, 1972a) this characteristic was an important one in predicting sentence difficulty.

Presence of syntactic cues to sentence structure should decrease sentence difficulty. This characteristic was examined in genitive sentences (cue: of), relative sentences (cue: relative pronoun), and ambiguous sentences (cue: the). In the author's previous study this sentence characteristic was not related to difficulty, but other writers had found that it was related to difficulty. Therefore, it seemed worthwhile to include it.

Semantic constraints on the interpretation of a sentence should decrease sentence difficulty. The semantic constraint considered in this study was "reversibility" in a sentence. A sentence is called reversible if the subject and object can be reversed, e.g. "Mary kissed Bill." It is called nonreversible if subject-object reversal is not possible semantically, e.g., "Mary cooked the egg." Reversibility was studied in dative and genitive sentences, since in the author's previous research it was found to predict difficulty.

Greater number of concepts ("content words") should increase sentence difficulty. This characteristic was studied in the genitive sentences, since it had predicted difficulty in the author's previous research.

Complexity of the subject noun phrase should increase sentence difficulty more than complexity of the object noun phrase. In addition to the characteristics studied by Gordon (1972a) one other characteristic,

complexity of the noun phrase, was added to the study to further broaden the generality of the findings. This additional characteristic is related to Gordon's feature concerning the interruption of a linguistic unit (see Table 1) in the following way. Relative clauses, which modify the subject noun phrase of a sentence, not only constitute an interruption of a linguistic unit, but simultaneously add complexity to the subject noun phrase. Relative clauses which modify the object noun do not interrupt a linguistic unit, although they do add complexity to the object noun phrase. It was therefore of interest to investigate a set of sentences in which the complexity of the noun phrase stemmed from something other than an interruption of a linguistic unit. This characteristic was studied in the complex noun phrase sentences.

Language Processing Strategy

Related to the second purpose of the study, another major purpose was to discover the extent to which children use the subject-verb-object (S-V-O) word order processing strategy to interpret complex sentences which are beyond their linguistic competence. This S-V-O interpretation strategy can be described as follows (Slobin and Welsh, 1972): When they are processing a sentence, children tend to scan the input searching for the first noun; when they find it they consider it to be the subject. Then they search for a verb, skipping over other words until they find it. Next, they search for another noun and consider it to be the object. If there is no other noun, or if there is another noun and another verb, then presumably each noun-verb sequence could be considered to be a subject followed by an intransitive verb (or be verb plus adjective). Of course this strategy is not necessarily a conscious one.

It had been suggested in the research literature that this strategy has been used by children in interpreting sentences, and it was a major focus of the present study to generalize this finding to a broader class of more complex sentences. In this project the syntactic S-V-O word order strategy was not distinguished from the semantic agent-action-object strategy. In other words, children were deemed to have used this S-V-O strategy if they interpreted the first noun of the sentence as the logical subject and agent, then interpreted the next available verb as the sentence verb, and finally interpreted the next available noun as the direct object. For example, children using this strategy would interpret the passive sentence, "Bill was kissed by Mary" as "Bill kissed Mary." It was anticipated that children would misinterpret complex sentences where two nouns or two verbs followed each other, or where the verb appeared at the beginning of the sentence preceding all nouns.

Subject Characteristics

A final purpose of the study was to discover whether the results for both simple and complex sentences are affected by subject characteristics. The study investigated whether results generalized to a population of lower class black children and to children of both sexes, and also whether the pattern of results changed over the age range tested.

Overview of Study

There were five major parts to this study, each based on the following five different types of test sentences: datives, genitives, comparison sentences, contrast sentences, and control sentences. For the first four parts of the study, which included the experimental sentences, paraphrase sets were prepared so that the test sentences in each set varied in grammatical form, but had approximately the same meaning.

To conduct the experiment in an efficient manner and to prevent the children's developing strategies for handling one particular type of sentence, all of the test sentences, both experimental and control, were combined into an omnibus test which was given to each of the children in three separate sessions.

Thus the project collected empirical data to examine psychological differences among the sentence forms within each experimental paraphrase set. Each child was tested on each form in either an imitation task or a comprehension task, and the number of correct responses was measured in order to determine the relative difficulty or complexity of the sentence forms. Then the predicted difficulty of sentences with selected characteristics was tested. Next, the response patterns were examined to determine whether there was evidence for a consistent interpretation strategy, namely, the subject-verb-object processing strategy. Finally, differences among age, race, and sex group performance were examined in the different sentence types.

In this report, there will be a separate section for each sentence type (i.e., datives) which will include the purpose and predictions, method, and results for that type. Given below, however, is a brief rationale for including each of the five sentence types.

Datives

Dative sentences are those involving direct and indirect object constructions. These complex linguistic structures were examined because they could be constructed to examine systematically the subject-verb-object word order strategy, as well as extend that strategy to include sentences with two objects. In addition, these dative constructions have not been extensively studied in children.

Genitives

Genitive sentences are those involving the genitive marker, 's, as well as paraphrases of such sentences. These very complex constructions were included to find out how a subject-verb-object processing strategy might be applied in situations where the verb of the sentence comes first. Also, these structures have not been studied in children's language.

Comparison Sentences

Comparison sentences were included primarily to relate the current research to that done by previous investigators. Two types of comparison sentences were included.

Passives. Active and passive sentences were included since there has been a considerable amount of work done on this sentence type. Thus, a comparison could be made between the difficulty of passives and the difficulty of the complex sentences studied in the current project. Note that these sentences are relatively easy compared to the other complex linguistic structures studied.

Relatives. These sentences were included to replicate some of the results of the Gordon (1972a) work, and to relate the results of that study to this new group of structures.

Contrast Sentences

Contrast sentences were included to broaden the generality of the research findings by adding kinds of sentences which could further extend the number of sentence characteristics being studied.

Ambiguous sentences. These sentences were included to examine another syntactic cue in sentences where it is of crucial importance to interpretation, namely, in sentences involving structural ambiguity.

There is a question as to whether structural ambiguity affects the difficulty children have in arriving at one meaning for such sentences.

Complex noun phrase sentences. As discussed above in the sentence characteristics section, these sentences were included to broaden the understanding of Gordon's finding on the sentence characteristic, "interruption of a linguistic unit."

Control Sentences

There were two types of control sentences, length control sentences and filler sentences.

Length controls. Grammatically simple sentences, which had the same length as the test sentences, were included as controls for sentence length.

Fillers. Filler sentences were included to prevent the children's developing strategies for sentence interpretation.

Of course, all of the five sentence types were included because the author felt that they were a good representative set of complex sentences which could be used to study the generality of (a) the sentence structure characteristics or factors studied by Gordon (1972a) and (b) the S-V-O processing strategy.

PART I. DATIVES

Purpose

The dative sentences in this study involved both direct and indirect objects. A representative set of sentences is shown in Table 3. Given below are the particular sentence characteristics studied, along with the reasons for including these structures, and the predictions made in each case.

Deviation from standard S-V-O word order should increase sentence difficulty.

First, dative sentences were studied to investigate the importance of subject-verb-object (S-V-O) word order in children's interpretation of sentences involving three nouns and a verb, occuring in the order noun-verb-noun-noun.

Prediction 1 (S-V-O word order): Forms a+b > Forms c+d+e. It was predicted that sentences with the logical subject first (Forms a and b) would be easier than sentences with the logical object first (Forms c, d, and e).

S-V-O word order characteristic extended: Deviation from S-V-DO-IO word order should increase sentence difficulty.

Second, datives were studied to extend previous studies of the basic S-V-O word order constellation to sentences with two objects. Subject-verb-direct object-indirect object (S-V-DO-IO) word order was predicted to be the simplest structure and deviations from this order were predicted to increase sentence difficulty. Note that in this study the syntactic S-V-DO-IO order corresponds to the semantic order, agent-action-object-dative.

There is a disagreement in the literature concerning whether the S-V-DO-IO order or the S-V-IO-DO order is easier for children, and this study contributed information which could help to resolve this disagreement.

TABLE 3

Representative Paraphrase Sets: Datives

Reversible Sentences

Form	Example Sentences
a	The girl is showing the woman to the boy.
b	The girl is showing the boy the woman.
c	The woman is being shown by the girl to the boy.
d	The boy is being shown the woman by the girl.
e	The woman is being shown to the boy by the girl.

Nonreversible Sentences

Form	Example Sentences
a	The doctor is giving the book to the nurse.
b	The doctor is giving the nurse the book.
c	The book is being given by the doctor to the nurse.
d	The nurse is being given the book by the doctor.
e	The book is being given to the nurse by the doctor.

Prediction 2. (S-V-DO-IO word order): Form a > Form b. It was predicted that in sentences with the logical subject first, sentences with DO-IO word order (Form a) would be easier than those with IO-DO order (Form b).

Prediction 3 (S-V-DO-IO word order): Forms c+e > Form d. It was predicted that for object-first sentences, those with the logical direct object in surface subject position (Forms c and e) would be easier than those with logical indirect object in surface subject subject position (Form d).

Prediction 4 (S-V-DO-IO word order): Form c > Form e. It was predicted that for sentences with the logical direct object in surface subject position, the sentence would be easier if the logical subject (Form c) preceded the logical indirect object (Form e).

Semantic constraints on the interpretation of a sentence should decrease sentence difficulty (Reversibility).

Third, datives were included to investigate the semantic constraint of reversibility in the interpretation of sentences. A reversible sentence is one in which the subject and object can be reversed (e.g., "The girl is showing the woman to the boy") while in a nonreversible sentence (e.g., "The doctor is giving the book to the nurse.") the subject and object cannot be reversed.

Prediction 5 (Reversibility): Nonreversible > Reversible. It was predicted that nonreversible sentences would be easier than reversible sentences.

Method

Subjects

The subjects were 108 children who attended nursery school in Chapel Hill and Carrboro, North Carolina. Thirty-six children in each of three different age groups were tested; the mean age for each group was, respect-

ively, 4,0; 5,0; and 6,0. Within each age group, the children were selected to represent a random sample of the school population in Chapel Hill and Carrboro, with two restrictions: (a) two-thirds of the children were white and one third, black, (b) an equal number of boys and girls were tested in each age and race grouping.

Materials

Six dative paraphrase sets, each including five forms, were constructed, making a total of 30 dative sentences in all. Three of these sets included reversible sentences in which the direct objects were animate, and could plausibly serve as the subject (agent) of the sentence, e.g. "The girl is showing the woman to the boy." The other three sets included nonreversible sentences in which the direct objects were inanimate, thus making it implausible that they could serve as the subject (agent) of the sentence, e.g. "The doctor is giving the book to the nurse."

Two representative paraphrase sets are shown in Table 3.

From the six paraphrase sets, the individual test items were selected so that each child received one-third of the sentences in each of three sessions. Of the test sentences presented to each child during a session, an equal number were of Forms a, b, c, d, and e; half of the sentences were reversible, and the other half were nonreversible.

Design and Procedure

Three stimulus sentence lists were constructed for the study as a whole. Each of the three lists utilized an equal number of sentences from each of the five parts of the study (e.g. datives). On each list there were ten datives, eight genitives, five comparison sentences, six contrast sentences, and eight control sentences. Each list then served as the stimulus

list for one test session making a total of three sessions. The order of presentation of the three lists was counterbalanced so that each list appeared an equal number of times in the first, middle, and last test sessions for the children. There were two versions of each list; one half of the subjects received one version and the other half received the second version. Thus there were a total of 37 sentences on each list, giving a total of 111 sentences in all.

Either an imitation task or a comprehension task was performed by each child on the three different days. Half of the children (54 subjects) were tested in imitation and the other half, in comprehension. The same sentence lists were used for both tasks. In the imitation task, the experimenter (E) presented a sentence and the child attempted to repeat exactly what (s)he had just heard. In the comprehension task, E presented a sentence and the child pointed to the picture that went with that sentence. The four pictures for each sentence all contained the same or similar objects, and these objects were arranged to test the dimensions that were of experimental interest. Examples of pictures are given in the Appendix. All pictures were pilot tested on a similar group of children before being used in this study.

The children were tested individually by a university student in sessions which lasted about forty minutes. After a short warm-up and training procedure, the stimulus sentences were presented by means of a Revox tape recorder at a rate which was suitable for each child. The experimental sessions were recorded on tape, using a Wollensak tape recorder. Periodically throughout the experiment, the children were given the opportunity to decorate a line drawing with colorful pictures of animals, birds, and flowers; at the end, they were allowed to choose a toy and play with it.

Results

For the imitation task, the children's responses were transcribed and scored for the number of correct responses, according to the procedure described in the Appendix. The responses were considered correct if the child repeated the sentences with the words in the correct order and with only minor changes or production problems. For the comprehension task, responses were correct if the child pointed to the right picture.

Repeated measures analyses of variance were performed for the imitation and for the comprehension tasks, following the multivariate method advocated by McCall and Appelbaum (1973). Single contrast scores for each subject were used in testing each of the five predictions. Because a number of statistical tests were performed, only differences at the .01 level or better will be reported.

Sentence Difficulty

The mean number of correct responses, standard deviations, and percent correct are shown in Table 4. The differences in sentence difficulty are discussed below in terms of the sentence characteristics described in the Purpose section.

Sentence Characteristics

In this study, five predictions were made concerning the sentence characteristics which should be related to performance difficulty for dative sentences. These predictions are summarized in Table 5, along with information concerning whether or not the predictions were confirmed.

When a multivariate analysis of the predicted differences in sentence difficulty was performed for the imitation task, the overall multivariate $F(4,39) = 54.10$, $p < .001$, while for the comprehension task the overall multivariate $F(4,39) = 16.66$, $p < .001$. Univariate F tests performed to test each of the predictions yielded the following results for predictions 1 through 4.

TABLE 4

Mean Number of Correct Responses, Standard Deviations, and Percent Correct: Datives

A. Reversible and Nonreversible Sentences Combined

Imitation

Form	a	b	c	d	e
Mean	2.07	1.59	.90	.81	.66
S.d	1.02	1.13	.95	.99	.87
Percent	69.1	53.1	29.9	27.2	21.9

Comprehension

Form	a	b	c	d	e
Mean	1.98	1.61	1.65	1.11	1.56
S.d	.99	1.13	1.02	.94	1.03
Percent	66.0	53.7	54.9	37.0	51.9

B. All Sentence Forms Combined

Imitation

	Reversible Sentences	Nonreversible Sentences
Mean	1.18	1.24
S.d	1.15	1.11
Percent	39.3	41.2

Comprehension

	Reversible Sentences	Nonreversible Sentences
Mean	1.11	2.05
S.d	.92	.97
Percent	37.0	68.4

TABLE 5

Predicted Results for Sentence Forms: Datives

Imitation

Prediction	Percent Correct		Prediction Confirmed	Significant Difference
1. a+b > c+d+e	a+b = 61.1	c+d+e = 26.3	yes	.001
2. a > b	a = 69.1	b = 53.1	yes	.001
3. c+e > d	c+e = 25.9	d = 27.2	no	NS
4. c > e	c = 29.9	e = 21.9	yes	NS
5. Nonreversible > Reversible	NR = 41.2	R = 39.3	yes	NS

Comprehension

Prediction	Percent Correct		Prediction Confirmed	Significant Difference
1. a+b > c+d+e	a+b = 59.8	c+d+e = 47.9	yes	.001
2. a > b	a = 66.0	b = 53.7	yes	.001
3. c+e > d	c+e = 53.4	d = 37.0	yes	.001
4. c > e	c = 54.9	e = 51.9	yes	NS
5. Nonreversible > Reversible	NR = 68.4	R = 37.0	yes	.001

Deviation from standard S-V-O word should increase sentence difficulty. Prediction 1 (Form a+b > Form c+d+e)[2] was confirmed for both imitation and comprehension, with $F(1,42) = 168.67$, $p < .001$ and $F(1,42) = 32.03$, $p < .001$, respectively.

S-V-O word order characteristic extended: Deviation from S-V-DO-IO word order should increase sentence difficulty. Prediction 2 (Form a > Form b) was confirmed in both imitation and comprehension, $F(1,42) = 21.64$, $p < .001$ and $F(1,42) = 15.27$, $p < .001$, respectively. Prediction 3 (Forms c+e > Form d) was not confirmed in imitation, although the difference was not significant. The prediction was confirmed in comprehension, however, and the difference was significant, $F(1,42) = 34.36$, $p < .001$. Prediction 4 (Form c > Form e) was confirmed both in imitation and in comprehension, but the differences were not statistically significant.

Semantic constraints on the interpretation of a sentence should decrease sentence difficulty (Reversibility). Prediction 5 (Nonreversible sentences > Reversible sentences) was confirmed in imitation, but the difference was not statistically significant. In comprehension the prediction was also confirmed, but this time the difference was statistically significant, $F(1,42) = 139.64$, $p < .001$. The significant main effect of reversibility was qualified by a significant reversibility x sentence form interaction, $F(4,39) = 7.34$, $p < .001$. The percent correct responses for reversible and nonreversible sentences, by sentence form, are given in the Appendix.

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[2]The notation "Form a+b > Form c+d+e", means that Forms a+b combined were predicted to have a greater mean number of correct responses than Forms c+d+e combined.

S-V-O Language Processing Strategy

For both the imitation and comprehension tasks, an error analysis was performed to ascertain whether the pattern of responses revealed any evidence that the children were using an S-V-O strategy in interpreting the dative sentences.

Imitation. For the imitation task, modal errors for each sentence form were tabulated to discover the characteristic error made by the children. The results are shown in Table 6. For Forms a and c, children maintained the form of the sentence, thereby giving no evidence either for or against an S-V-DO-IO strategy for these forms. However, for Form b, the sentence form was changed to Form a, indicating an S-V-DO-IO interpretation. Both Forms d and e were changed to Form c, yielding a DO-V-S-IO interpretation. This order is closer to an S-V-DO-IO interpretation than the IO-V-DO-S order of model Form d sentences or the DO-V-IO-S order of model Form e sentences.

Comprehension. For each sentence form in the comprehension task, there were four pictures from which to choose. A tabulation was made of the picture chosen most frequently by the children, and also the picture which was chosen by the second largest number of children. The results are shown in Table 7. Of the fourteen possible picture choices appropriate for this analysis, eleven were either correct responses or those which indicated that the child was using a S-V-O interpretation strategy, i.e. that the child was interpreting the sentences as if they were in the S-V-DO-IO order. However, note that for Form a the correct picture was also the S-V-DO-IO picture; therefore, the collective "second choice" picture had to be some other picture by default. That meant that in only one out of the fourteen cases did children choose something other than a

TABLE 6

Characteristic Errors in the Imitation Task: Datives

Form		Error
a	Model (Example):	The girl is showing the woman to the boy.
	Description of Error:	Noun substitution (Form of sentence is unchanged).
	Error (Example):	The man is showing the woman to the boy.
b	Model (Example):	The girl is showing the boy the woman.
	Description of Error:	Inserted <u>to</u> before the third noun. (Sentence form is now the same as Form a).
	Error (Example):	The girl is showing the boy to the woman.
c	Model (Example):	The woman is being shown by the girl to the boy.
	Description of Error:	Noun substitution (Form of sentence is unchanged.)
	Error (Example):	The woman is being shown by the woman to the boy.
d	Model (Example):	The boy is being shown the woman by the girl.
	Description of Error:	Inserted <u>by</u> before the second noun and substituted <u>to</u> for <u>by</u> before the third noun (Sentence form is now the same as Form c.)
	Error (Example):	The boy is being shown by the woman to the girl.
e	Model (Example):	The woman is being shown to the boy by the girl.
	Description of Error:	Switched <u>by</u> and <u>to</u> in the sentence. (Sentence form is now the same as Form c.)
	Error (Example):	The woman is being shown by the boy to the girl.

TABLE 7

Correct Responses, S-V-DO-IO Responses, and Other Responses in the Comprehension Task: Datives

	Reversible Sentences		Nonreversible Sentences	
Form	Picture Chosen by the Largest Number of children	Picture Chosen by the Second Largest Number of children	Picture Chosen by the Largest Number of children	Picture Chosen by the Second Largest Number of children
a	Correct picture (It is also the S-V-DO-IO picture)	(Other picture)	Correct picture (It is also the S-V-DO-IO picture)	(Other picture)
b	S-V-DO-IO picture	Correct picture	See note	
c	Correct picture	S-V-DO-IO picture	See note	
d	S-V-DO-IO picture	Correct picture	Correct picture	S-V-DO-IO picture
e	Correct picture	Other picture	See note	

Note: For nonreversible sentence forms b, c, and e, an S-V-DO-IO picture was not possible semantically and was therefore not presented. Example for Form e: "The book is giving the nurse to the doctor" is not possible semantically. For all three of these forms the correct picture was the one chosen by the largest number of children.

Key: Correct picture (self-explanatory)
S-V-DO-IO picture = picture which would be chosen if the child were using an S-V-DO-IO processing strategy
Other picture = any other picture

correct picture, or a S-V-DO-IO picture, unless it was by default. If the analysis is confined to the seven pictures chosen by the largest number of children (the collective "first choice" pictures), then the children always chose a correct picture or else an S-V-DO-IO picture.

For the comprehension task, it would appear that in the majority of cases, children either correctly interpreted the sentence forms, or else they interpreted them as if they represented an S-V-DO-IO order.

Thus, in both imitation and comprehension, there was some evidence that children used an S-V-DO-IO interpretation strategy in processing dative sentences which were beyond their linguistic competence.

Subject Characteristics

There were three subject characteristics of interest in this study; age, race, and sex. Of the three, the analyses of variance revealed that main effects for sex were not statistically significant for any of the sentence types (e.g. datives). Therefore, sex differences will not be a focus of this report, and they will not be reported in tables concerning subject characteristics. There were some significant age and race differences, however, so information concerning these two kinds of subject differences will be included in tables for each sentence type.

Table 8 shows the percent correct responses on dative sentences, by age and race, along with the significant differences for each. For datives, there were significant age and race differences in both imitation and comprehension. Older children performed better than younger children, and white children performed better than black children.

TABLE 8

Subject Characteristics: Datives

A. Percent Correct Responses by Age

4 Years		5 Years		6 Years	
Imitation	Comprehension	Imitation	Comprehension	Imitation	Comprehension
23.0	41.5	44.1	53.1	53.7	63.5

B. Percent Correct Responses by Race

White		Black	
Imitation	Comprehension	Imitation	Comprehension
45.6	58.3	29.4	41.5

C. Significant Differences for Age and Race

	Imitation	Comprehension
Age	.001	.001
Race	(.006)[3]	.001

[3] Parentheses indicate that the level of significance was reduced below the .01 level by a correction for length (in the case of "sentence characteristics" tables) or for dialect (in the case of "subject characteristics" tables). See Part V.

PART II. GENITIVES

Purpose

The "genitive" sentences in this study were those involving the genitive marker, 's, as well as paraphrases of such sentences. A representative set of sentences is shown in Table 9. Given below are the particular sentence characteristics studied, along with the reasons for including these structures, and the predictions made in each case.

Deviation from standard S-V-O word order should increase sentence difficulty.

First, genitive sentences were studied to investigate the importance of subject-verb-object (S-V-O) word order in children's interpretation of sentences with complex noun phrases involving nominalizations (e.g., "The mother's kissing of the baby"). There was a special focus on such sentences in which the verb appeared first (e.g., "The kissing of the baby by the mother").

Prediction 6 (S-V-O word order): Form a > Form c. It was predicted that Form a sentences with a noun (agent) first would be easier than Form c sentences in which a verb appeared first.

Presence of syntactic cues to sentence structure should decrease difficulty (Cue: of).

Second, gentive sentences were studied to determine whether the cue, of, would decrease sentence difficulty. In the author's previous study (Gordon, 1972a) another syntactic cue, the relative pronoun, was not related to difficulty; however other writers had found it to be related to difficulty. A disconfirmation of the prediction would confirm the author's previous results. Therefore, it seemed worthwhile to investigate the syntactic cue, of.

Prediction 7 (syntactic cue: of): Form a > Form b. It was predicted that sentences with the syntactic cue (Form a) would be easier than sentences without it (Form b).

TABLE 9

Representative Paraphrase Sets: Genitives

Reversible Sentences

Form	Example Sentences
a	The mother's kissing of the baby pleased the daddy.
b	The mother's kissing the baby pleased the daddy.
c	The kissing of the baby by the mother pleased the daddy.
d	The kissing of the baby pleased the daddy.

Nonreversible Sentences

Form	Example Sentences
a	The women's lifting of the table surprised the man.
b	The woman's lifting the table surprised the man.
c	The lifting of the table by the woman surprised the man.
d	The lifting of the table surprised the man.

Greater number of concepts ("content words") should increase sentence difficulty.

Third, genitives were studied because sentences with a greater number of concepts had been found more difficult in the author's previous research. It was of interest to see if this straightforward result would be replicated, with the same tendency for this sentence characteristic to be more important (i.e., more strongly predictive) in imitation than in comprehension.

Prediction 8 (more concepts): Form d > Form c. It was predicted that sentences omitting the agent (Form d) would be easier than those including it (Form c).

Semantic constraints on the interpretation of a sentence should decrease sentence difficulty (Reversibility).

Fourth, genitives were included to investigate the semantic constraint of reversibility in the interpretation of genitive sentences.

Prediction 9 (Reversibility): Nonreversible > Reversible. It was predicted that nonreversible sentences would be easier than reversible sentences.

Method

Subjects

The subjects were the same 108 children described in Part I on datives.

Materials

Six genitive paraphrase sets, each including four forms, were constructed, making a total of 24 genitive sentences in all. Three of these sets included reversible sentences, and three sets included nonreversible sentences. Two representative sets are shown in Table 9. From the six paraphrase sets the individual test items were selected using the same method described for the datives in Part I.

Design and Procedure.

The procedure was the same as that described in Part I.

Results

The imitation task and comprehension task were scored and analyzed using the method described in the Results section of Part I.

Sentence Difficulty

The mean number of correct responses, standard deviations, and percent correct are shown in Table 10. The differences in sentence difficulty are described below in terms of the sentence characteristics given in the Purpose section.

Sentence Characteristics

In this study, four predictions were made concerning the sentence characteristics which should be related to performance difficulty for genitive sentences. These predictions are summarized in Table 11, along with information concerning whether or not the predictions were confirmed.

When a multivariate analysis of the predicted differences in sentence difficulty was performed for the imitation task, the overall multivariate $F(3,40) = 75.55$, $p < .001$, while for the comprehension task the overall multivariate $F(3,40) = 13.19$, $p < .001$. Univariate tests performed to test each of the predictions yielded the following results for predictions 1 through 3.

Deviation from standard S-V-O word order should increase difficulty. Prediction 1 (Form a > Form c) was confirmed for both imitation and comprehension, with $F(1,42) = 22.21$, $p < .001$ and $F(1,42) = 27.84$, $p < .001$, respectively.

Presence of syntactic cues to sentence structure should decrease difficulty (Cue: of). Prediction 7 (Form a > Form b) was not confirmed, and the differences were not statistically significant.

TABLE 10

Mean Number of Correct Responses, Standard Deviations, and Percent Correct: Genitives

A. Reversible and Nonreversible Sentences Combined

Imitation				
Form	a	b	c	d
Mean	.90	1.14	.38	2.16
S.d.	1.12	1.00	.78	1.07
Percent	29.9	38.0	12.7	71.9

Comprehension				
Form	a	b	c	d
Mean	2.15	2.25	1.68	1.95
S.d.	.95	.93	1.03	.93
Percent	71.6	75.0	55.9	65.1

B. All Sentences Forms Combined

Imitation		
	Reversible Sentences	Nonreversible Sentences
Mean	1.14	1.16
S.d.	1.16	1.22
Percent	37.7	38.6

Comprehension		
	Reversible Sentences	Nonreversible Sentences
Mean	1.79	2.23
S.d.	1.01	.91
Percent	59.6	74.2

TABLE 11

Predicted Results for Sentence Forms: Genitives

Imitation

Prediction	Percent Correct		Prediction Confirmed	Significant Difference
6. a > c	a = 29.9	c = 12.7	yes	.001
7. a > b	a = 29.9	b = 38.0	no	N.S.
8. d > c	d = 71.9	c = 12.7	yes	.001
9. Nonreversible > Reversible	NR = 38.6	R = 37.7	yes	N.S.

Comprehension

Prediction	Percent Correct		Prediction Confirmed	Significant Difference
6. a > c	a = 71.6	c = 55.9	yes	.001
7. a > b	a = 71.6	b = 75.0	no	N.S.
8. d > c	d = 65.1	c = 55.9	yes	(.01)
9. Nonreversible > Reversible	NR = 74.2	R = 59.6	yes	.001

Greater number of concepts ("content words") should increase sentence difficulty. Prediction 8 (Form d > Form c) was confirmed. In imitation, $F(1,42) = 226.66$, $p < .001$. In comprehension, $F(1,42) = 7.27$, $p < .01$, a level of significance which was not so high as that for imitation.

Semantic constraints on the interpretation of a sentence should decrease sentence difficulty (Reversibility). Prediction 9 was confirmed in imitation, but the difference was not statistically significant. In comprehension the prediction was also confirmed, but this time the difference was statistically significant, $F(1,42) = 24.82$, $p < .001$. The significant main effect of reversibility was qualified by a significant reversibility x sentence form interaction, $F(3,40) = 5.85$, $p < .002$. There was a significant reversibility x sex interaction in both imitation and comprehension, $F(1,42) = 8.95$, $p < .005$ and $F(1,42) = 9.57$, $p < .004$, respectively. In the Appendix are tables giving the percent correct responses for reversible and nonreversible sentences, by sentence form for comprehension and also by sex for imitation and comprehension.

S-V-O Language Processing Strategy

For both the imitation and comprehension tasks, an error analysis was performed to ascertain whether the pattern of responses revealed any evidence that the children were using an S-V-O strategy in interpreting the genitive sentences.

Imitation. For the imitation task modal errors for each sentence form were tabulated to discover the characteristic error made by the children. The results are shown in Table 12. For Forms a and b the noun-verb-noun order in the complex noun phrase was retained, thereby giving no evidence either for or against an S-V-O strategy. Form d was maintained, thereby yielding no evidence for or against, while Form c was changed to Form d. This latter change meant that a verb-noun (V-N) sequence was substituted for a verb-noun-noun (V-N-N) sequence in the complex noun phrase. Although a

TABLE 12

Characteristic Errors in the Imitation Task: Genitives

Form		Error
a	Model (Example):	The mother's kissing of the baby pleased the daddy.
	Description of Error:	Deleted of (sentence form is now the same as Form b).
	Error (Example):	The mother's kissing the baby pleased the daddy.
b	Model (Example):	The mother's kissing the baby pleased the daddy.
	Description of Error:	Deleted 's
	Error (Example):	The mother kissing the baby pleased the daddy.
c	Model (Example):	The kissing of the baby by the mother pleased the daddy.
	Description of Error:	Deleted the second prepositional phrase (with by) (Sentence form is now the same as Form d)
	Error (Example):	The kissing of the baby pleased the daddy.
d	Model (Example):	The kissing of the baby pleased the daddy.
	Description of Error:	Noun substitution (form of sentence is unchanged).
	Error (Example):	The kissing of the boy pleased the daddy.

TABLE 13

Correct Responses, S-V-O Responses, and other Responses

in the Comprehension Task: Gentives

	Reversible Sentences		Nonreversible Sentences	
Form	Picture Chosen by the Largest Number of children	Picture Chosen by the Second Largest Number of children	Picture Chosen by the Largest Number of children	Picture Chosen by the Second Largest Number of children
a	Correct picture (It is also the S-V-O picture)	(Other picture)	Correct picture (It is also the S-V-O picture)	(Other picture)
b	Correct picture (It is also the S-V-O picture)	(Other picture)	Correct picture (It is also the S-V-O picture)	(Other picture)
c	Correct picture	S-V-O picture	See note	
d	Correct picture	S-V-O picture	See note	

Note: For nonreversible sentence forms c and d, an S-V-O picture was not possible semantically and was therefore not presented. Example for Form c: "The table's lifting of the woman surprised the man" is not possible semantically. For bothof these forms the correct picture was the one chosen by the largest number of children

Key: Correct picture (self-explanatory)
S-V-O picture = picture which would be chosen if the child were using an S-V-O processing strategy
Other picture = any other picture

V-N order is closer to a S-V-O order than is a V-N-N order, nevertheless this sort of deletion can provide only weak evidence for an S-V-O strategy. Of course, the greater ease of performance of Form a when compared to Form c, reported above, does provide some evidence for the strategy.

Comprehension. For each sentence form in the comprehension task, there were four pictures from which to choose. A tabulation was made of the picture chosen most frequently by the children, and also the picture which was chosen by the second largest number of children. The results are shown in Table 13. Of the twelve possible picture choices appropriate for this analysis, eight were either correct responses or those which indicated that the child was using an S-V-O interpretation strategy, i.e., that the child was interpreting the complex noun phrase parts of the sentences as if they were in the S-V-O order. In the other four cases, the correct picture was also the S-V-O picture; therefore the collective "second choice" picture had to be some other picture by default. In other words, in their collective first and second choices, the children never chose anything besides the correct picture or the S-V-O picture, except by default. If the analysis is confined only to the picture chosen by the largest number of children (the collective "first choice" picture), then all the pictures were either the correct picture or else the S-V-O picture.

For the comprehension task, it would appear that the children either correctly interpreted the sentence forms, or else they interpreted them as if they represented a S-V-O order.

Thus, in imitation the evidence is weak, but in comprehension there was some evidence that children used a S-V-O interpretation strategy in processing genitive sentences which were beyond their linguistic competence.

Subject Characteristics

Table 14 shows the percent correct responses on genitive sentences, by age and race, along with the significant differences for each. For genitives,

older children performed better than younger children, and there were significant age differences in both imitation and comprehension. White children performed better than black children, but the differences were not statistically significant at the .01 level.

TABLE 14

Subject Characteristics: Genitives

A. Percent Correct Responses by Age

4 Years		5 Years		6 Years	
Imitation	Comprehension	Imitation	Comprehension	Imitation	Comprehension
19.4	52.8	39.8	69.7	55.1	78.2

B. Percent Correct Responses by Race

White		Black	
Imitation	Comprehension	Imitation	Comprehension
43.1	70.7	28.2	59.3

C. Significant Differences for Age and Race

	Imitation	Comprehension
Age	.001	.001
Race	N.S.	N.S.

PART III. COMPARISON SENTENCES

Purpose

The comparison sentences were included primarily to relate the current research to that done by previous investigators. Two types of comparison sentences were included. First, active and passive sentences were used. Second, two types of sentences involving relative clauses were included. In one type the order of the words in the relative clause was S-V-O (e.g., "The duck that is chasing the mouse is black") while in the other the order was O-S-V (e.g., "The lion that the elephant is following is happy"). A representative set of sentences is shown in Table 15. Given below are the particular sentence characteristics studied, along with the reasons for including these structures, and the predictions made in each case.

Deviation from standard S-V-O word order should increase sentence difficulty.

First, comparison sentences were studied to relate the research on datives and genitives to previous work done on the importance of S-V-O word order in children's interpretation of passives and relatives.

Prediction 10 (S-V-O word order): Form a > Form b. It was predicted that active sentences with an S-V-O order (Form a) would be easier than passive sentences which have an O-V-S order (Form b).

Prediction 11 (S-V-O word order): S-V-O Forms a+b > O-S-V Forms a+b. It was predicted that sentences which had S-V-O order in the relative clauses (S-V-O Forms a+b) would be easier than sentences which had O-S-V order in the relative clauses (O-S-V Forms a+b). A confirmation of this prediction would replicate results obtained in the author's previous research.

Presence of syntactic cues to sentence structure should decrease sentence difficulty (Cue: relative pronoun).

Second, comparison sentences were included to replicate the author's previous work on syntactic cues. The prediction, as stated, is in line with

TABLE 15

Representative Paraphrase Sets: Comparison Sentences

Passives

Form	Example Sentences
a	The boy is kicking the cow.
b	The cow is being kicked by the boy.

Relatives: Subject-Verb-Object

Form	Example Sentences
a	The duck that is chasing the mouse is black.
b	The duck chasing the mouse is black.

Relatives: Object-Subject-Verb

Form	Example Sentences
a	The lion that the elephant is following is happy.
b	The lion the elephant is following is happy.

other work in the literature but in conflict with the author's previous results. The author's work showed that the relative pronoun did not decrease sentence difficulty, in contrast to other work on older children and adults which indicated that it did decrease the difficulty. Thus, if the prediction was confirmed, it would support the other work. If it was not confirmed, it would replicate the previous results found by the author.

Prediction 12 (Syntactic cue: relative pronouns): Form a (S-V-O + O-S-V) > Form b (S-V-O + O-S-V). It was predicted that sentences which included the relative pronoun in the relative clause (Form a, S-V-O and O-S-V) would be easier than sentences which had no relative pronoun in the relative clause (Form b, S-V-O and O-S-V). As noted above, the author's previous results would be replicated by a disconfirmation of this prediction.

Method

Subjects

The subjects were the same 108 children described in Part I on datives.

Materials

Three passive paraphrase sets, each including two forms, were constructed, making a total of six passive sentences. Four relative paraphrase sets, each including two forms, were also constructed, making a total of eight relative sentences. Two of these sets included sentences involving relative clauses with their words in S-V-O order while the other two included relative clauses with words in O-S-V order. Representative paraphrase sets are shown in Table 15. From these paraphrase sets the individual test items were selected using the same method described for the datives in Part I.

Design and Procedure

The procedure was the same as that described in Part I.

Results

The imitation task and comprehension task were scored and transcribed using the method described in the Results section of Part I.

Sentence Difficulty

The mean number of correct responses, standard deviations, and percent correct are shown in Table 16. The differences in sentence difficulty are described below in the section on sentence characteristics.

Sentence Characteristics

Three predictions were made concerning the sentence characteristics which should be related to performance difficulty for comparison sentences. These predictions are summarized in Table 17, along with information concerning whether or not the predictions were confirmed.

Deviation form standard S-V-O word order should increase difficulty. Prediction 10 (Passive Form a > Form b) was confirmed for imitation and comprehension, with $F(1,42) = 24.50$, $p < .001$ and $F(1,42) = 20.59$, $p < .001$, respectively. Prediction 11 (Relative Form S-V-O, a+b, is greater than Relative Form O-S-V, a+b) was also confirmed in imitation and comprehension, with $F(1,42) = 43.37$, $p < .001$ and $F(1,42) = 14.08$, $p < .001$, respectively.

Presence of syntactic cues to sentence structure should decrease sentence difficulty (Cue: relative pronouns). Prediction 12 (Relative Form a, S-V-O + O-S-V, is greater than Relative Form b, S-V-O + O-S-V) was not confirmed in the imitation task, and the difference was significant, $F(1,42) = 40.94$, $p < .001$. The prediction was confirmed in the comprehension task, but the difference was not significant. There was also a significant word order x syntactic cue interaction in imitation, $F(1,42) = 8.93$, $p < .005$. (See Table 17)

S-V-O Language Processing Strategy

For both the imitation and comprehension tasks, an error analysis was performed to ascertain whether the pattern of responses revealed any evidence that the children were using an S-V-O strategy in interpreting the comparison sentences. In both imitation and comprehension, the most frequent response for the active and passive sentences was a correct response. Thus, there was no evidence either for or against an S-V-O strategy in the error analysis.

TABLE 16

Mean Number of Correct Responses, Standard Deviations, and Percent Correct: Comparison Sentences

A. Passives

	Imitation		Comprehension	
Form	a	b	a	b
Mean	2.83	2.44	2.68	2.13
s.d.	.61	.98	.54	1.08
Percent	94.4	81.5	89.5	71.0

B. Relatives

Relatives: Subject-Verb-Object

	Imitation		Comprehension	
Form	a	b	a	b
Mean	.54	1.20	1.00	.87
s.d.	.66	.83	.73	.65
Percent	26.9	60.2	50.0	43.5

Relatives: Object-Subject-Verb

	Imitation		Comprehension	
Form	a	b	a	b
Mean	.28	.54	.57	.50
s.d.	.56	.69	.69	.69
Percent	13.9	26.9	28.7	25.0

TABLE 17

Predicted Results for Sentence Forms: Comparison Sentences

Imitation

Sentence Type	Prediction	Percent Correct		Prediction Confirmed	Significant Difference
Passives	10. a>b	a=94.4	b=81.5	yes	(.001)
Relatives	11. SVO(a+b)> OSV(a+b)	SVO=43.5	OSV=20.4	yes	.001
	12. a(SVO+OSV)> b(SVO+OSV)	a=20.4	b=43.5	no	(.001)

Comprehension

Sentence Type	Prediction	Percent Correct		Prediction Confirmed	Significant Difference
Passives	10. a>b	a=89.5	b=71.0	yes	(.001)
Relatives	11. SVO(a+b)> OSV(a+b)	SVO=46.7	OSV=26.8	yes	.001
	12. a(SVO+OSV)> b(SVO+OSV)	a=39.3	b=34.2	yes	N.S.

Therefore, the focus of this section will be on the relative sentences.

Imitation (relatives). For the imitation task, modal errors for each relative sentence form were tabulated to discover the characteristic errors made by the children. The results are shown in Table 18. From the sentences with S-V-O relative clauses, the children formed two simple S-V sentences; this happened for both Form a and Form b. From the sentences with O-S-V relative clauses, only Form a yielded two simple S-V sentences. Form b resulted in a compound subject-verb-object or a compound subject-(ungrammatical) compound verb. In all cases the characteristic errors were sentences in the S-V or S-V-O order, thus providing some evidence for the S-V-O strategy.

Comprehension (relatives). For each relative sentence form in the comprehension task, there were again four pictures from which to choose. A tabulation was made of the picture chosen most frequently by the children, and also the picture which was chosen by the second largest number of children. The results are shown in Table 19. All of the eight possible picture choices included either the correct or the S-V-O picture. Thus, it would appear that the children either correctly interpreted the relative sentence forms, or else they interpreted them as if they represented a S-V-O order.

Therefore, in both imitation and in comprehension, there is some evidence that children used a S-V-O interpretation strategy in processing relative sentences which were beyond their linguistic competence.

Subject Characteristics

Table 20 shows the percent correct responses on the comparison sentences, by age and race, along with the significant differences for each. For both passives and relatives, older children performed better than younger children, and the differences were statistically significant in both imitation and comprehension. White children performed better than black children on both sentence types and in both tasks, but the differences were statistically significant only for the passives in imitation and the relatives in comprehension.

TABLE 18

Characteristic Errors in the Imitation Task: Comparison Sentences (Relatives)

Relatives: Subject-Verb-Object

Form		
a	Model (Example):	The duck that is chasing the mouse is black.
	Description of Error:	Deleted relative pronoun
	Error (Example):	The duck is chasing. The mouse is black.
b	Model (Example):	The duck chasing the mouse is black.
	Description of Error:	Added is after the first noun.
	Error (Example):	The duck is chasing. The mouse is black.

Relatives: Object-Subject-Verb

Form		
a	Model (Example):	The lion that the elephant is following is happy.
	Description of Error:	Moved the second noun to a position following the verb
	Error (Example):	The lion is following. The elephant is happy.
b	Model (Example):	The lion the elephant is following is happy.
	Description of Error:	Formed a compound subject.
	Error (Example):	The lion and the elephant is following (is) happy. (the)

TABLE 19

Correct Responses, S-V-O Responses, and other Responses in the Comprehension Task: Comparison Sentences (Relatives)

Relatives: Subject-Verb-Object

Form	Picture Chosen by the Largest Number of Children	Picture Chosen by the Second Largest Number of Children
a	Correct picture	S-V-O picture
b	Correct picture	S-V-O picture

Relatives: Object-Subject-Verb

Form	Picture Chosen by the Largest Number of Children	Picture Chosen by the Second Largest Number of Children
a	S-V-O picture	Correct picture
b	S-V-O picture	Correct picture

Key: Correct picture (self-explanatory)

S-V-O picture = picture which would be chosen if the child were using an S-V-O processing strategy.

TABLE 20

Subject Characteristics: Comparison Sentences

A. Percent Correct Responses by Age

Sentence Type	4 Years		5 Years		6 Years	
	Imitation	Comprehension	Imitation	Comprehension	Imitation	Comprehension
Passives	68.5	66.7	98.1	80.6	97.2	93.5
Relatives	14.6	29.2	34.7	30.6	46.5	50.7

B. Percent Correct Responses by Race

Sentence Type	White		Black	
	Imitation	Comprehension	Imitation	Comprehension
Passives	93.5	83.3	76.9	74.1
Relatives	36.5	42.0	22.9	26.4

C. Significant Differences for Age and Race

	Sentence Type	Imitation	Comprehension
Age	Passives	.001	.002
	Relatives	.002	.001
Race	Passives	(.002)	N.S.
	Relatives	N.S.	.003

PART IV. CONTRAST SENTENCES

Purpose

Contrast sentences were included to broaden the generality of the research findings by adding sentences which could further extend the number of sentence characteristics being studied. Since there was no intention to examine language processing strategies for these sentences, that section will be omitted form Part IV.

Two types of contrast sentences were included. First, ambiguous sentences were used to examine another syntactic cue in sentences where it was of crucial importance to interpretation, namely, in sentences involving structural ambiguity. These "ambiguous sentences" included both ambiguous sentences, and unambiguous sentences which represented two alternative meanings for each ambiguous sentence. Second, sentences with complex noun phrases were included to broaden the author's previous finding on the sentence characteristic, "interruption of a linguistic unit." (See the Introduction.) These complex noun phrase sentences were reversible genitive sentences which had a complex noun phrase appearing at the end of the sentence. They were compared with the reversible genitive sentences described in Part II; those sentences had a complex noun phrase at the beginning of the sentence. A representative set of sentences is shown in Table 21. Given below are the particular sentence characteristics studied, along with the reasons for including these structures, and the predictions made in each case.

Presence of syntactic cues to sentence structure should decrease sentence difficulty (Cue: the).

First, contrast sentences were included to study the importance of a syntactic cue, the, which resolved the ambiguity in structurally ambiguous sentences. There was a question as to whether structural ambiguity affects the difficulty children have in arriving at one meaning for such sentences.

TABLE 21

Representative Paraphrase Sets: Contrast Sentences

Ambiguous Sentences

Form	Example Sentences
a	Flying planes can scare the boys.
b	Flying the planes can scare the boys.
c	The flying planes can scare the boys.

Complex Noun Phrase Sentences

Form	Example Sentences
a	The sister liked the mommy's tickling of the daddy.
b	The sister liked the tickling of the daddy by the mommy.
c	The sister liked the tickling of the daddy.

Note: These complex noun phrase sentences are reversible genitive sentences which have a complex noun phrase appearing at the end of the sentence. See Table 9 for reversible genitive sentences which have the complex noun phrase at the beginning of the sentences ("Genitives-Reversible Sentences").

Prediction 13 (Syntactic cue: the): Form b+c > Form a. It was predicted that unambiguous sentences which represented the two alternative meanings for ambiguous sentences (Form b and Form c) would be easier than the corresponding ambiguous sentences (Form a).

Complexity of the subject noun phrase should increase sentence difficulty more than complexity of the object noun phrase.

The reason for studying this characteristic was explained on pages 14 and 15 of the Introduction. These sentences were included to investigate a set of sentences in which the complexity of the noun phrase stemmed from something other than an interruption of a linguistic unit.

Prediction 14 (Complex noun phrase): End > Beginning. It was predicted that sentences with a complex noun phrase at the end of the sentence (Forms a, b, c of the "complex noun phrase" sentences) would be easier than sentences with the complex noun phrase at the beginning of the sentence (Forms a, c, d of the "reversible genitive" sentences).

Method

Subjects

The subjects were the same 108 children described in Part I on datives.

Materials

Three ambiguous sentence paraphrase sets, each including three forms, were constructed, making a total of nine ambiguous sentence forms. In addition, three complex noun phrase paraphrase sets, each including three forms, were constructed, making a total of nine complex noun phrase forms. Representative paraphrase sets are shown in Table 21.

Design and Procedure

The procedure was the same as that described in Part I.

Results

The imitation task and comprehension task were scored and transcribed using the method described in the Results section of Part I.

Sentence Difficulty

The mean number of correct responses, standard deviations, and percent correct are shown in Table 22. The differences in sentence difficulty are described below in the section on sentence characteristics.

Sentence Characteristics

Two predictions were made concerning the sentence characteristics which should be related to performance difficulty for contrast sentences. These predictions are summarized in Table 23 along with information concerning whether or not the predictions were confirmed.

An examination of the table shows that neither prediction was confirmed, and that the result occurred in both imitation and comprehension. The differences in the sentence forms were significant in three out of the four cases; only for the prediction involving complex noun phrases in imitation was the difference not significant.

The failure of the syntactic cue prediction supported the type of finding which appeared in the author's previous work.

The failure of the complex noun phrase prediction indicated that the characteristic studied in the author's previous work, "interruption of a linguistic unit," might be the underlying reason for the difficulty of the complex noun phrases studied. In that previous work complex noun phrases, involving relative clauses, which appeared at the beginning of the sentence were more difficult than those which appeared at the end. In the current study, complex noun phrases involving nominalizations did not appear to differ so greatly in difficulty, depending on whether they appeared at the beginning versus the end of the sentence.

Subject Characteristics

Table 24 shows the percent correct responses on the contrast sentences, by age and race, along with the significant differences for each. For both

TABLE 22

Mean Number of Correct Responses, Standard Deviations, and Percent Correct: Contrast Sentences

A. Ambiguous Sentences

	Imitation			Comprehension		
Form	a	b	c	a	b	c
Mean	2.44	1.67	2.04	2.52	.93	1.72
s.d.	.90	.99	1.01	.75	.91	.92
Percent	81.5	55.6	67.9	84.0	30.9	57.4

B. Complex Noun Phrase Sentences

	Imitation			Comprehension		
Form	a	b	c	a	b	c
Mean	.80	.56	1.91	1.41	.98	1.68
s.d.	1.10	.86	1.19	1.04	.94	.80
Percent	26.5	18.5	63.6	46.9	32.7	56.2

TABLE 23

Predicted Results for Sentence Forms: Contrast Sentences

Imitation

Sentence Type	Prediction	Percent Correct		Prediction Confirmed	Significant Difference
Ambiguous Sentences	13. b+c > a	b+c=61.7	a=81.5	no	.001
Complex Noun Phrase Sentences	14. End > Beg.	End=36.2	Beg.=37.7	no	n.s.

Comprehension

Sentence Type	Prediction	Percent Correct		Prediction Confirmed	Significant Difference
Ambiguous Sentences	13. b+c > a	b+c=44.1	a=84.0	no	.001
Complex Noun Phrase Sentences	14. End >Beg.	End=45.3	Beg.=59.6	no	.001

types of contrast sentences, older children generally performed better than younger children, and the differences were statistically significant in both imitation and comprehension. In addition, white children performed better than black children, but the differences were significant for the ambiguous and complex noun phrase sentences only in imitation, not in comprehension.

TABLE 24

Subject Characteristics: Contrast Sentences

A. Percent Correct Responses by Age

Sentence Type	4 Years		5 Years		6 Years	
	Imitation	Comprehension	Imitation	Comprehension	Imitation	Comprehension
Ambiguous Sentences	51.9	73.1	73.5	85.2	79.6	100.0
Complex Noun Phrase Sentences	18.5	34.6	35.2	40.7	54.9	60.5

B. Percent Correct Responses by Race

Sentence Type	White		Black	
	Imitation	Comprehension	Imitation	Comprehension
Ambiguous Sentences	71.0	89.4	63.0	79.6
Complex Noun Phrase Sentences	42.3	48.1	24.1	39.5

TABLE 24 (Continued)

Subject Characteristics: Contrast Sentences

C. Significant Differences for Age and Race

	Sentence Type	Imitation	Comprehension
Age	Ambiguous Sentences	.001	.001
	Complex Noun Phrase Sentences	.001	.001
Race	Ambiguous Sentences	.002	N.S.
	Complex Noun Phrase Sentences	.006	N.S.

PART V. CONTROL SENTENCES

Purpose

There were two types of control sentences, length control sentences and filler sentences.

Length Controls

Grammatically simple sentences, which had the same length as the test sentences, were included as controls for sentence length. A representative group of sentences is shown in Table 25.

Fillers

Filler sentences were included to prevent the children's developing strategies for sentence interpretation. Also these were relatively simple sentences which were easy for the children, in contrast to some of the test sentences, and which therefore provided them with sure success.

Since only sentence difficulty and subject characteristics for the length controls were of interest, only that information will be included in the Results section below.

Method

Subjects

The subjects were the same 108 children described in Part I on datives.

Materials

Grammatically simple sentences of five different lengths were constructed. Each sentence was either seven, eight, nine, ten, or eleven words long. There were two sentences of each length, or ten length control sentences in all. There were also fifteen filler sentences.

TABLE 25

Representative Sentences: Length Controls

Length (in words)	Example Sentences
7	The man is washing the plane today.
8	The lady is pouring the milk at home.
9	The girl is picking the flower in the garden.
10	The fireman is driving the truck on the road today.
11	The teacher is putting the book on the table at school.

TABLE 26

Mean Number of Correct Responses, Standard Deviations, and Percent Correct: Length Controls

Imitation

Length (in words)	7	8	9	10	11
Mean	1.74	1.61	1.46	1.33	1.20
s.d.	.52	.60	.74	.85	.79
Percent	87.0	80.6	73.1	66.7	60.2

Comprehension

Length (in words)	7	8	9	10	11
Mean	1.89	1.70	1.63	1.72	1.80
s.d.	.37	.50	.52	.45	.49
Percent	94.4	85.2	81.5	86.1	89.8

Design and Procedure

The procedure was the same as that described in Part I.

Results

The imitation task and comprehension task were scored and transcribed using the method described in the Results section of Part I.

Sentence Difficulty

The mean number of correct responses, standard deviations, and percent correct are shown in Table 26. Repeated measures analyses of variance were performed for the imitation and for the comprehension tasks, following the multivariate method advocated by McCall and Appelbaum (1973).

In imitation, there was an overall effect for length, $F(4,39) = 7.48$, $p < .001$. Examination of the polynominal contrasts showed a significant effect for the linear contrast, $F(1,42) = 27.09$, $p < .001$. In comprehension, there was no overall significant effect for length at the .01 level ($p < .022$).

Subject Characteristics

Table 27 shows the percent correct responses on the length controls, by age and race, along with the significant differences for each. Again, older children performed better than younger children, and the differences were statistically significant. White children performed better than black children, but the differences were significant only in imitation.

Additional Analyses

Length

Length of sentence did affect the children's performance on the control sentences, particularly in imitation. It is possible that the difficulty of the experimental sentences could be conceptualized as relating both to their sentence characteristics as well as to their length.

TABLE 27

Subject Characteristics: Length Controls

A. Percent Correct Responses by Age

4 Years		5 Years		6 Years	
Imitation	Comprehension	Imitation	Comprehension	Imitation	Comprehension
49.4	75.6	82.2	91.1	88.9	95.6

B. Percent Correct Responses by Race

White		Black	
Imitation	Comprehension	Imitation	Comprehension
80.8	90.6	58.9	81.1

C. Significant Differences for Age and Race

	Imitation	Comprehension
Age	.001	.001
Race	(.001)	N.S.

Thus, because length of sentence could have some effect on the results for the experimental sentence forms, a correction for length of sentence was applied as follows. The proportion correct for each experimental sentence form (i.e. Datives Form a) was calculated, as was the proportion for each length control. Then, for every sentence form, the proportion correct for the experimental sentence was subtracted from the proportion correct for the appropriate length control (control which had the same number of words as the experimental sentence). Then the same analyses were performed as were described in Parts I through III above. It is only appropriate to consider the effect of length when doing analyses of the grammatical form of the sentences, since these are the only comparisons in which the length of sentence would differ. In other cases (i.e. comparison of the sexes) all subjects would have received all sentences, and so effect of length should not be a crucial consideration.

The length correction was applied to dative, genitive, and comparison sentences. Most of the results reported above in Parts I through III were not changed by the correction for length. However, the significance levels for some sentence types were attenuated, as reported below. Note that in Parts I through III, the significance levels so affected were surrounded by parentheses in the tables of results.

All the dative results were unchanged. For the genitives, the difference between Form c and Form d was no longer significant in comprehension. Also, two of the three interactions were no longer significant; neither the reversibility x sex interaction in imitation nor the reversibility x sentence form interaction in comprehension remained significant.

For comparison sentences, the results were as follows. There were no significant differences remaining for passives, either for main effects or interactions, when the correction was applied. That probably

meant that the children knew these relatively easy grammatical forms, and the differences were due to length. For the relatives, the syntactic cue difference in imitation between Form a (SVO+OSV) and Form b (SVO+OSV) was no longer significant. The word order x syntactic cue interaction in imitation was also no longer significant.

The major differences in results, then, were that the significant differences for passives, and for most of the interactions, were eliminated. Also, the syntactic cue difference for relatives in imitation, and the content word difference for genitives in comprehension, were eliminated.

In the Conclusion, the results will be discussed in terms of the information given in Parts I through III, and the length information will be indicated in footnotes. The major conclusions of the study were not affected by the correction for length.

Dialect

Since some of the children tested were black, the imitation task was rescored for all children, this time giving credit when the children imitated using sentences which were correct in black dialect. The imitation responses for all children were scored using the new method, and the same analyses described in Parts I through IV above were again performed.

The pattern of results reported above for the sentence forms, in the sections on "sentence difficulty" and "sentence characteristics," did not change. However, when the results for "subject characteristics" were examined, three previously significant results for race became nonsignificant at the .01 level. For datives, the level dropped from .006 to .022; for passives, it dropped from .002 to .015; and for length controls it dropped from .001 to .019. A list of significance levels for imitation, given for analyses performed using the standard score and

those performed using the "dialect score," is reported in Table 28.

It should be noted that any conclusions drawn concerning race differences should consider the fact that most of the black children were from a lower socioeconomic class than the white children. That was a reflection of the population in the Chapel Hill-Carrboro community where the testing was conducted. As rated on the Hollingshead two factor index of social position, about 90% of the white children were in a middle or higher class grouping (Hollingshead classes I, II, III), while about 67% of the black children were in a lower class grouping (Hollingshead classes IV, V).

Since the purpose of the experiment was to discover whether the pattern of results would generalize across different populations, this purpose was not affected by the confounding of "race" and socioeconomic status. However, the reader must be careful in drawing other conclusions about race.

One more statement about dialect is in order. The white children tested in this study included both standard English speakers and those who spoke one of the various North Carolina dialects. The Chapel Hill-Carrboro community is near the geographical boundary of two major dialect regions. That, plus the constant influx of people from the northern United States, makes this university community very heterogeneous linguistically. In fact many people in the community hear and understand at least two versions of English. The speech is so heterogeneous that it was not feasible to classify the white children into just two categories, standard English and North Carolina dialect speakers.

A questionnaire given to parents revealed that all the children watched several hours of television each day, thus making it reasonably certain that all children (both black and white) were exposed to standard English. That was the only version of English one could be reasonably sure that all children heard. Therefore, all testing was done in standard English. An inspection of the results for the white speakers indicated no performance differences between standard and dialect speakers, and so no distinction among white speakers was made in the research report.

In sum, the only group differences among children appeared to be the "race" difference reported above; and that was just a tendency for the white children to perform at a higher level than the black children, rather than any difference in the pattern of results for the different grammatical structures.

TABLE 28

Significance Levels Obtained

from Analyses of Variance: Race[4]

		Imitation	Comprehension
Datives	S	.006*	.001*
	D	.022	
Genitives	S	.012	.019
	D	.031	
Passives	S	.002*	> .10
	D	.015	
Relatives	S	.06	.003*
	D	.07	
Ambiguous	S	.002*	.018
	D	.002*	
Complex Noun Phrase	S	.006*	.059
	D	.01*	
Length	S	.001*	> .10
	D	.019	

Key: S=scored using standard score.

D=scored using dialect score, which gave credit for correct black dialect responses.

*=significant at the .01 level.

[4] Note that race and socioeconomic status were confounded. This fact, which did not interfere with the purpose of the study, was explained in the report.

CONCLUSION

Discussion and Summary

There were four purposes to this study, relating to sentence difficulty, sentence characteristics, S-V-O language processing strategy, and subject characteristics, respectively. A summary of the results for each will be discussed below.

Sentence Difficulty

The first purpose of the study was to determine the difficulty of selected types of complex sentences, and to ascertain the relative difficulty of one sentence type versus another. Table 29 shows the percent correct responses for all the complex sentences on the imitation and comprehension tasks. Difficulty ranges from a relatively easy set of passive sentences to a fairly difficult set of sentences involving relative clauses. Few, if any, other studies in the literature have documented the relative difficulty of complex sentences for these age groups.

Sentence Characteristics

A major purpose of the study was to gain a better understanding of the characteristics differentiating sentences which were difficult for children from those which were easy. Table 30 summarizes the predictive power of the five sentence characteristics for the imitation and comprehension tasks.

There were two sentence characteristics which increased sentence difficulty as predicted: (1) deviation from S-V-O word order and (1a) deviation from S-V-DO-IO order; and also (4) presence of a greater number of concepts.

Deviation from standard S-V-O word order should increase sentence difficulty. This prediction was confirmed in all eight cases for imitation and comprehension, and the differences were all statistically significant. If children do interpret sentences as if they were in S-V-O order (S-V-O processing strategy), then such a result was to be expected.

TABLE 29

Sentence Difficulty Given in Percent Correct Responses for All Complex Sentences on the Imitation Task and the Comprehension Task

Sentence Type	Imitation	Comprehension
Datives		
Reversible	39.3	37.0
Nonreversible	41.2	68.4
S-V-O (Forms a + b)	61.1	59.8
O-S-V (Forms c + d + e)	26.3	47.9
All Datives	40.2	52.7
Genitives		
Reversible	37.7	59.6
Nonreversible	38.6	74.2
SVO (Form a)	29.9	72.6
OSV (Form c)	12.7	55.9
All Genitives	38.1	66.9
Comparison Sentences		
Passives	88.0	80.2
Relatives		
S-V-O (Forms a + b)	43.5	46.8
O-S-V (Forms a + b)	20.4	26.9
All Relatives	31.9	36.8
Contrast Sentences		
Ambiguous	68.3	86.1
Complex Noun Phrase	36.2	45.3

TABLE 30

Predictive Power of The Five Sentence Characteristics for All Complex Sentences on the Imitation Task and the Comprehension Task[5]

1. Deviation from standard S-V-O word order should increase sentence difficulty. (Predictions 1,6,10,11)

   Imitation: Predictions were confirmed in all four cases.
   Differences were significant in all cases. [6]

   Comprehension: Predictions were confirmed in all four cases.
   Differences were significant in all cases. [6]

   1a. Deviation from S-V-DO-IO word order should increase sentence difficulty. (Predictions 2,3,4)

   Imitation: Predictions were confirmed in two cases out of three.
   Differences were significant in one case.

   Comprehension: Predictions were confirmed in all three cases.
   Differences were significant in two cases.

2. Presence of syntactic cues to sentence structure should decrease sentence difficulty. (Predictions 7,12,13)

   Imitation: Predictions were not confirmed in any of the three cases.
   In two of the cases the differences were significant in the opposite direction.[6]

   Comprehension: Predictions were confirmed in one case out of three.
   Difference was significant in one case.

3. Semantic constraints on the interpretation of a sentence should decrease sentence difficulty (Reversibility).

   Imitation: Predictions were confirmed in both cases. (Predictions 5,9)
   Differences were not significant.

   Comprehension: Predictions were confirmed in both cases.
   Differences were significant in both cases.

4. Greater number of concepts ("content words") should increase sentence difficulty. (Prediction 8)

   Imitation: The one prediction was confirmed.
   The difference was significant.

Comprehension: The one prediction was confirmed.
The difference was significant.[6]

5. Complexity of the subject noun phrase should increase sentence difficulty more than complexity of the object noun phrase. (Prediction 14)

Imitation: The one prediction was not confirmed.
The difference was not significant.

Comprehension: The one prediction was not confirmed.
The difference was significant in the opposite direction.

[5] This table does not include the changes in significance levels which would be obtained when a correction for length is applied.

[6] If the length correction were applied, each of these significance levels would be decremented by 1.

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S-V-O word order characteristics extended: Deviation from S-V-DO-IO word order should increase sentence difficulty. This prediction was also confirmed, in five of six cases, though the results were statisitically significant only half the time. The conflict in the literature concerning the primacy of S-V-DO-IO word order versus S-V-IO-DO word order was resolved in favor of the former, at least for these sentences.

Greater number of concepts ("content words") should increase sentence difficulty. This prediction was confirmed, in imitation and comprehension. The effect was stronger for imitation than for comprehension, however, a result also obtained in the author's previous work (Gordon, 1972a).

There was one sentence characteristic which decreased sentence difficulty as predicted: (3) presence of semantic constraints on interpretation.

Semantic constraints on the interpretation of a sentence should decrease sentence difficulty (Reversibility). The predictions were confirmed in all four cases, but the results were significant only in comprehension. This facilitating effect of reversibility, with significant differences limited to comprehension, was also found in the author's previous work.

There were two sentence characterisitcs for which the predictions were not confirmed: (2) presence of a syntactic cue and (5) complexity in the subject noun phrase.

Presence of syntactic cues to sentence structure should decrease sentence difficulty (Cues: of, the, relative pronoun). This prediction was disconfirmed in five cases out of six, with significant differences in half of these cases. Research with older children and adults had indicated a facilitative effect for the relative pronoun, while the author's previous work indicated that sentences with relative pronouns were not easier for younger children. The disconfirmation of this syntactic cue prediction resolved this difference in favor of the author's previous findings, at least for this set of sentences and this age group. Perhaps a syntactic cue

can facilitate performance only where it is completely understood, and perhaps the younger children studied in the current research did not understand these cues. Nevertheless, the current findings do indicate that syntactic cues do not always facilitate performance; that was clearly demonstrated in this research with younger children.

Complexity of the subject noun phrase should increase sentence difficulty more than complexity of the object noun phrase. The two predictions were not confirmed, though the differences were statistically significant in only one case. This failure of the complex noun phrase prediction indicated that the presence of a sentence characteristic studied in the author's previous work, "interruption of a linguistic unit," might be the underlying reason for the difficulty of the complex noun phrases (involving relative clauses) which appeared in the subject position. Further discussion of this point can be found in the Introduction and in the Results section for the contrast sentences.

In general, the results for sentence characteristics found in the author's previous work (Gordon, 1972a) generalized across the current set of sentence structures.

S-V-O Language Processing Strategy

Another major purpose was to discover whether children used a subject-verb-object (S-V-O) word order processing strategy to interpret complex sentences which were beyond their linguistic competence. This strategy was described on page 15 of the Introduction.

Since subjects usually made a correct response on tasks involving passive sentences, the results for passives did not provide evidence either for or against an S-V-O strategy. Error analyses for datives, genitives, and relatives did provide descriptive evidence for an S-V-O processing strategy, however.

Although the evidence for genitives obtained in the imitation task tended to be weak or neutral, evidence for datives and relatives in that task indicated that children's imitations often represented either a correct interpretation or an S-V-O interpretation of the sentences. Results obtained in the comprehension task for genitives, datives, and relatives indicated that the children's picture choices almost always corresponded either to a correct interpretation or else to an S-V-O interpretation.

Thus it appeared that children did use an S-V-O strategy of sentence interpretation for these complex sentences.

Subject Characteristics

A final purpose of the study was to discover whether the results for both simple and complex sentences were affected by subject characteristics. The results showed that the author's previous findings related to sentence characteristics did generalize to a population of lower class black children, to children of both sexes, and to the different age groups tested.

Though the pattern of results was the same for the various subject groups, nevertheless there were some absolute differences among the groups of children. Statistical analyses revealed no significant main effects for sex, but there were age and race differences.

Age. For all the sentence types, older children generally performed better than younger children, and the overall age differences were statistically significant at the .001 or .002 levels.

Race. First, it should be mentioned again that there was no clear-cut separation of socioeconomic status and race. That was a reflection of the composition of the population in the community where the testing was done. As mentioned above, a purpose of the study was to see if the pattern of results found for white middle class children generalized across other populations, and the results indicated that such a generalization

occurred. However, caution should be used when drawing conclusions about race differences.

Second, though white children performed better than black children on all of the sentence types, the differences were significant at the .01 level in only about half the cases. In fact, they were significant at the .01 level in only about one-fourth of the cases, if credit was given for black dialect. (See Table 28)

One can therefore conclude that there was not a different pattern of results for white versus black children, and that there was some tendency for the white children's performance to be absolutely better.

Significance

Contributions

The contributions to psycholinguistic knowledge were three-fold: theoretical, empirical, and methodological.

Theoretical. The experiments demonstrated that certain characteristics of complex sentences were related to the psychological complexity, or difficulty, of these sentences for children in an imitation task, or a comprehension task, or both. It also provided some evidence that children used an S-V-O language processing strategy in interpreting sentences which were beyond their linguistic competence.

Empirical. The study provided new data on the difficulty for young children of selected complex sentences. It also indicated that the pattern of results for the complex sentences, found for white middle class children, generalized to a population of lower class black children, to children of both sexes, and to several age groups.

Methodological. The imitation and comprehension tasks could be adapted to test normal children on other grammatical forms. They could also be used as a diagnostic tool to assess grammatical development in children with speech disorders, and in children from disadvantaged groups.

In sum, the unique contributions of the author's work were (1) the synthesizing of the important sentence characteristics related to psychological complexity, and (2) the systematic experimental testing of all these factors at one time, since that had not been done before the author's previous study. Thus the project identified factors which should help define psychological complexity in child language and provided some evidence that children were using a subject-verb-object "language processing strategy" in interpreting complex sentences which were beyond their competence.

Educational Applications

This work on the normal acquisition of grammar is important in its own right, but it also has many educational applications. For example, knowledge of how children's grammar develops would help teachers and writers of children's books to explain things to children using the grammatical form which they will understand because it is appropriate for their age and/or level of language development. Not only does the study have implications for the language of classroom instruction and for curriculum materials, but is is also related to the homogeneity of class groupings and the teaching strategies which might be appropriate for different groups.

Work on the normal acquisition of grammar is also essential if speech therapists are to successfully diagnose and treat speech defects. At the present time, for example, they are hampered in their diagnoses because they lack just such information about normal development of language. And they have difficulty in prescribing a therapeutic program since they do not know exactly how child grammar normally develops. It is therefore very important to investigate the course of language development in order to have a baseline against which to judge speech development. Such a baseline,

found in these experiments, would be very useful in the development of programs for "disadvantaged" groups as well. These materials could be adapted for testing of dialect speakers and the results could help school teachers in their instruction of these children. Understanding language acquisition in such children would be an essential part of any attempt to manipulate the influence of sociocultural factors in language development.

An appropriate follow-up to this research might very well involve one of educational applications discussed above.

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APPENDIX

Appendix A Scoring Procedure for the Imitation Task

Appendix B Sample Pictures Used in the Comprehension Task

Appendix C Percent Correct Responses for Selected Dative and Genitive Sentences

APPENDIX A

Scoring Procedure for the Imitation Task

A Sentences which are completely correct.
Example: The girl is throwing the ball to the boy.

A' Sentences in which the child had production problems.
Example: The (pause) The girl is throwing the ball to the boy.

B Sentences in which the child made minor mistakes.
Example: A girl is throwing the ball to a boy.

C Sentences in which one or more lexical changes occurred.
Example: The girl is throwing the ball to the woman.

D Other grammatical sentences, divided into
(1) those with the same meaning as the model.
Example: The girl is throwing the boy the ball.

(2) those whose meaning differed from the model.
Example: The girl is throwing the ball and the boy is throwing the ball.

E Ungrammatical sentences, divided into
(1) those with the same meaning as the model.
Example: The girl are throwing the ball to the boy.

(2) those with a different meaning.
Example: The boy throwing to woman.

(3) those which are incomplete.
Example: The girl.

F Failures, which include all other sentences.

Note: In this study, a score representing the sum of categories A,A',and B was used as the score for correct responses. In other words, only imitations which were very good repetitions of the model sentences were counted as correct.

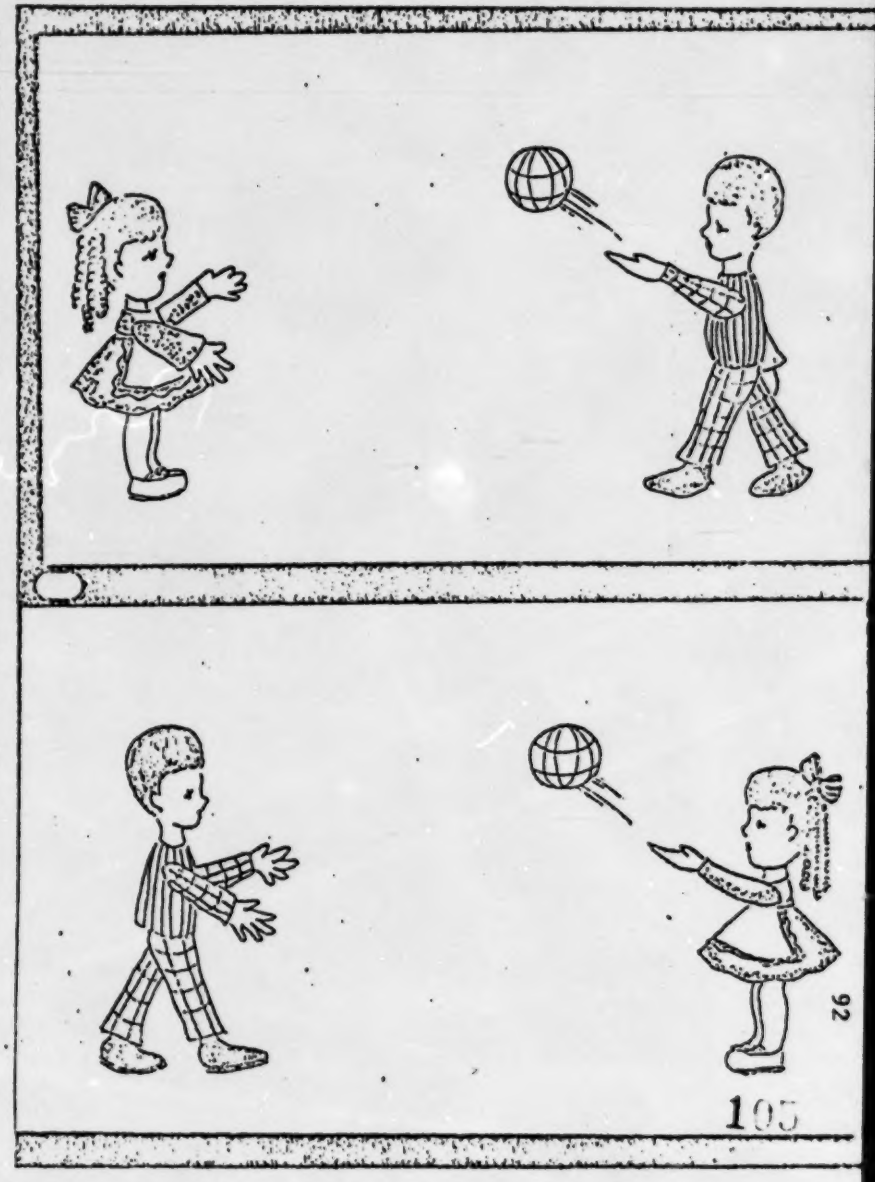
APPENDIX B

Sample Pictures Used in the Comprehension Task

1. Dative nonreversible sentences.
2. Genitive reversible sentences (complexity at the beginning of the sentence).
3. Relative SVO sentences.

Dative-nonreversible:

a. "The girl is throwing the ball to the boy.
b. "The girl is throwing the boy the ball."
c. "The ball is being thrown by the girl to the boy."
d. "The boy is being thrown the ball by the girl."
e. "The ball is being thrown to the boy by the girl."



Genitive-beginning:

a. "The mother's kissing of the baby pleased the daddy."
b. "The mother's kissing the baby pleased the daddy."
c. "The kissing of the baby by the mother pleased the daddy."
d. "The kissing of the baby pleased the daddy."

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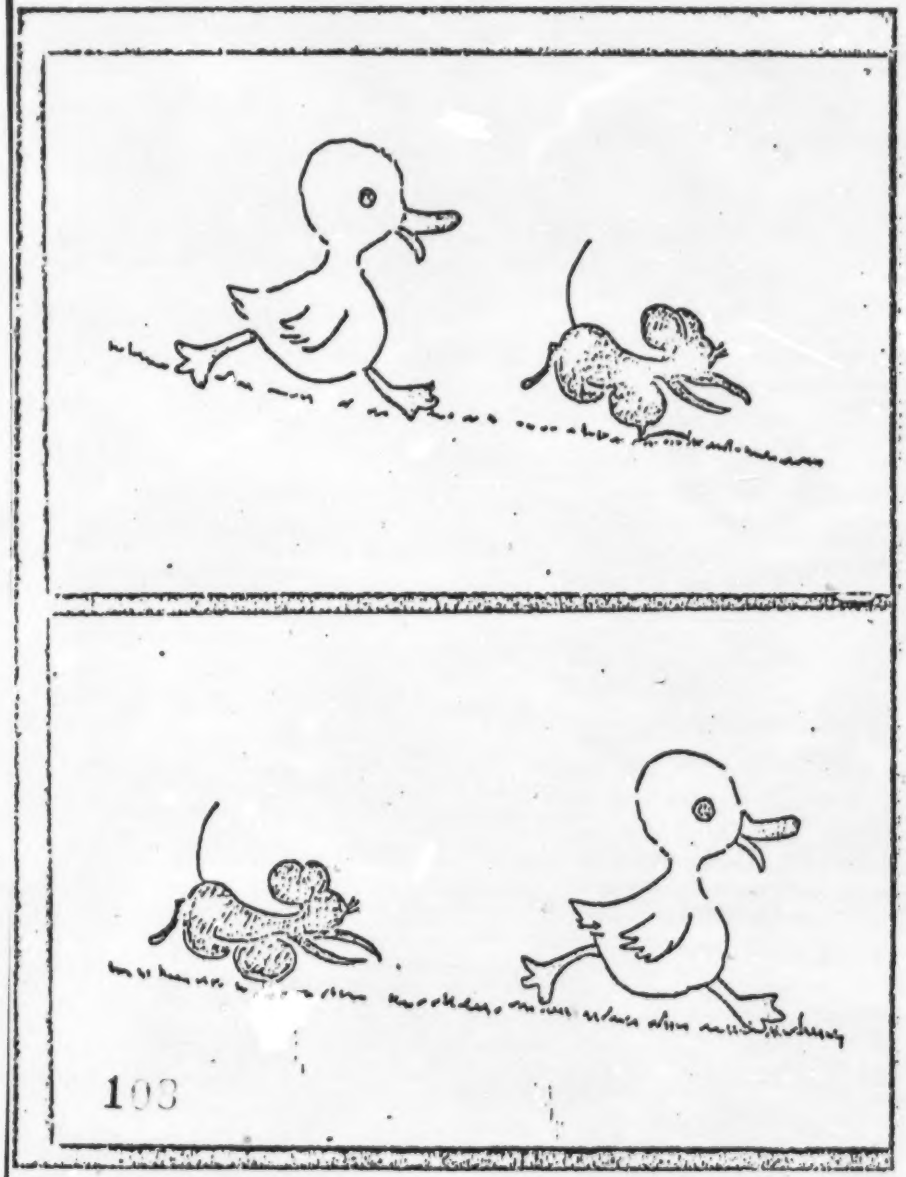
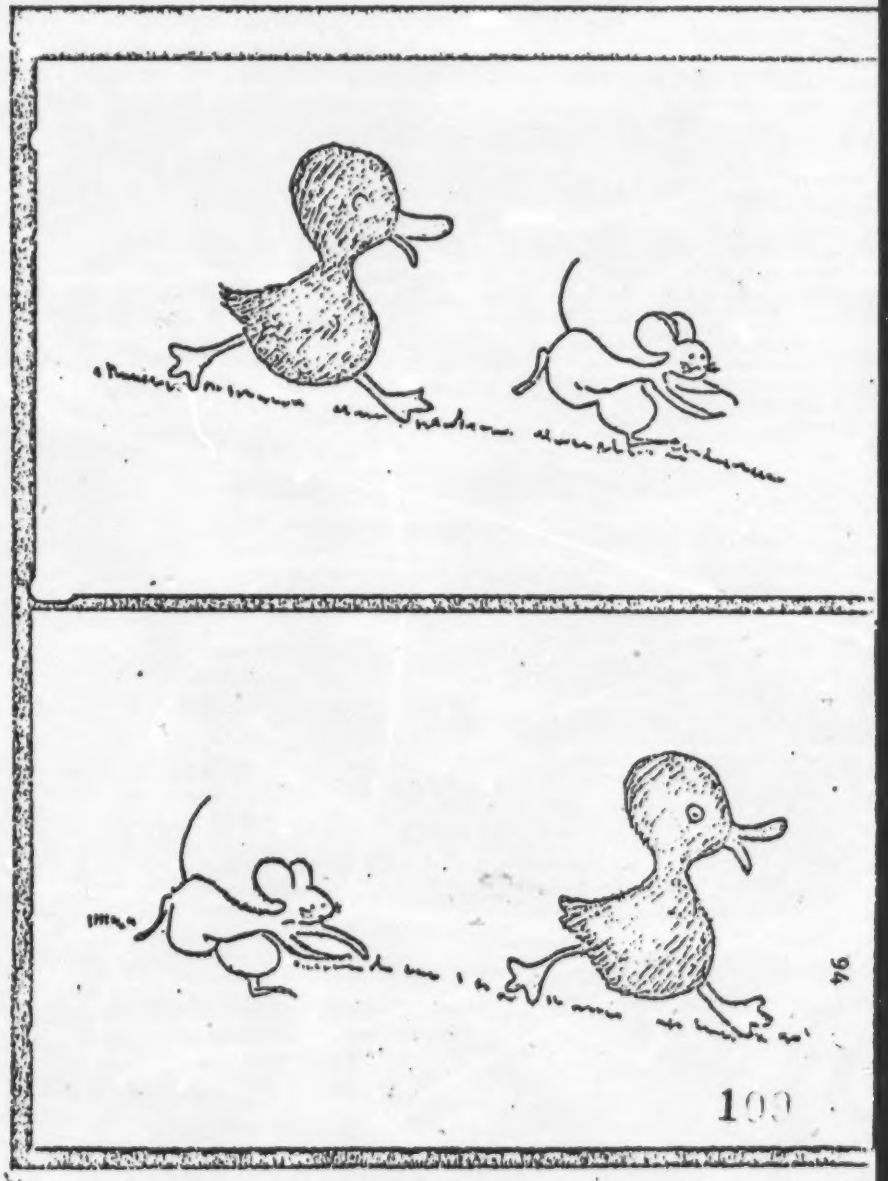
Relative SVO:

a. "The duck that is chasing the mouse is black."

b. "The duck chasing the mouse is black."





APPENDIX C

Percent Correct Responses for Selected Dative and Genitive Sentences

1. Table C-1: Percent correct responses for reversible and nonreversible sentences, by sentence form: Datives.

2. Table C-2: Percent correct responses for reversible and nonreversible sentences, by sentence form: Genitives.

3. Table C-3: Percent correct responses for reversible and nonreversible sentences, by sex: Genitives.

TABLE C-1

Percent Correct Responses for Reversible and Nonreversible Sentences, by Sentence Form: Datives

Comprehension

Reversible Sentences					
Form	a	b	c	d	e
	51.9	27.2	38.9	28.4	38.9

Nonreversible Sentences					
Form	a	b	c	d	e
	80.2	80.2	71.0	45.7	64.8

TABLE C-2

Percent Correct Responses for Reversible and Nonreversible Sentences by Sentence Form: Genitives

Comprehension

	Reversible Sentences			
Form	a	b	c	d
	63.0	67.3	42.6	65.4

	Nonreversible Sentences			
Form	a	b	c	d
	80.2	82.7	69.1	64.8

TABLE C-3

Percent Correct Responses for Reversible and Nonreversible Sentences, by Sex: Genitives

Imitation

Sex	Reversible Sentences	Nonreversible Sentences
Male	32.1	38.6
Female	43.2	38.6

Comprehension

Sex	Reversible Sentences	Nonreversible Sentences
Male	61.1	66.7
Female	58.0	81.8